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ABSTRACT

Knowledge is a necessary condition for any kind of progress in our society, and the teacher is an important factor in transferring knowledge. Distance learning (DL) enables the transfer of knowledge from one place to another. There are different methods of operating DL (videoconference, Internet, satellite), each with its advantages and disadvantages. DL is accepted as an innovation in the field of education and instruction. However, any change in education is only as effective as the ability of the teachers to successfully accommodate the change. This study evaluated the level and quality of the teacher-learner interaction and included three phases: (1) defining the circumstances and situations where the research can be performed; (2) constructing research tools and proving their reliability and validity; and (3) operating the research--collecting information on the teacher-learner interaction. The first phase examined the connection between the teacher's willingness to adopt innovations and the personality trait of risk-taking. The research sample was made up of 80 teachers. Risk-taking and attitude toward innovation (computer) in education questionnaires were administered. Five different teacher-learner interactions (i.e., social, procedural, expository, explanatory, and cognitive) were defined. The research data was used to construct a matrix for evaluating the teacher-learner interaction. (Contains 26 references.) (MES)

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Content Analysis as a Tool for Evaluating the Effectiveness of Distance Learning Systems

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Abstract: Knowledge is a necessary condition for any kind of progress in our society, and the teacher is an important factor in transferring knowledge. Distance learning enables the transfer of knowledge from one place to another. There are different methods of operating DL (videoconference, internet, satellite), each with its advantages and disadvantages. DL is accepted as an innovation in the field of education and instruction. However, any change in education is only as effective as the ability of the teachers to successfully accommodate the change. This study evaluates the level and quality of the teacher-learner interaction and included three phases: a) Defining the circumstances and situations where the research can be performed; b) Constructing research tools and proving their reliability and validity; c) Operating the research - collecting information on the teacher-learner interaction. During the past three years our research team worked on the first two phases of the research.

Introduction

The challenges facing schools today are in the realm of teaching development so that with the assistance of teachers, the learners will be able to deal more effectively with the problems posed by the world in which they live by becoming independent learners and mastering basic skills. Each individual learner needs a unique set of circumstances in order to learn to the best of his ability. The fulfillment of the learner's potential is one of the better methods of enabling learners to cope with social demands. The contribution of the teacher to the process of learning is very significant. The teacher-learner interaction is an important condition for any kind of learning and for acquiring knowledge. The personal relation between the teacher and the learner is crucial for developing the learner's ability, curiosity and level of thinking. However, in many countries there is lack of good teachers, and a lack of financial resources for coping with educational needs. In widely scattered placed it is difficult to have good teachers, compared to main cities. This has increased the need for using distance learning. Distance learning (DL) is a teaching method in which the teacher and the learners are separated from each other by place and/or time. It enables the transfer of knowledge from one place to another (Holmberg 1986) and the rapid development of computers and electronics has contributed to the increase in the effectiveness of DL (Dede 1990, Feasly 1983, Pain 1989). The interaction between a teacher and a learner, or among the teachers themselves, can be performed with the aid of computers, videoconference, radio, satellite, internet, fax, telephone, television or in mailing some learning materials. Each communications technology has its advantages and disadvantages. We should learn the characteristics of the different communications technologies and media and how they have been used in distance education. All communication technologies are accepted by teachers as being an innovation in the field of education and instruction. When they are introduced into the classroom, the teacher must make some changes in his instructional and teaching methods so as to accommodate the communication technology's efficiency in the instructional process. However, any institutional curriculum or instructional change is only as effective as the ability of the teaching staff to accommodate the change successfully.

The effectiveness of any staff development policy can only be considered in the light of how the teachers themselves respond to such a policy. The understanding of teachers' behaviors and attitudes is a prerequisite for the initiation of any kind of reform in teaching and instructional methods. The connection between change and personality variables is well known in society in general and in education in particular. When society feels that a fundamental change is necessary it calls upon innovative leaders to initiate the necessary changes. This is also true for education (Duke 1987). DL is a fairly new instructional aid and only those teachers whose personalities feel comfortable with novel and innovative teaching methods will react

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positively to DL and make a firm decision to use DL in the classroom. Research aimed at evaluating the teacher-learner interaction should be operated under circumstances where the teacher reacts naturally and does not feel frightened. Only in such an isolated situation will the data on the different interactions and their effects be accurate. The first phase of this research is to define such isolated circumstances. Different communications technologies are used in our project: a) Two-way videoconferencing (via cable, ISDN, 384K). This allows the learners and the instructor to interact face to face and is the closest match to traditional classroom instruction. b) Computer conferencing which allows the learners and instructors to interact via a computer network. They can send messages to each other (by electronic mail) as well as transfer data files. c) Two-way videoconferencing (one way via satellite with the learner responding via email). The learner can see the lecturer on the computer screen and can ask questions by email or by microphone. DL can alleviate the teacher's task of transferring information, so that he/she are free to deal with the learner as an individual and the teacher becomes more of an educator and less of a source of information. In our research various variables were collected, defined, isolated and analyzed by a variety of research tools, including observations, interviews and questionnaire. The lessons were also recorded on a video tape. The information collected helped us define the duty of the teacher in the process of teaching, which communications media are best for a given course and how the media should be combined for maximal effectiveness.

The Study

Teacher personality and innovation in education

The aim of the first phase of this research was to examine the connection between the teacher's willingness to adopt innovations and the personality trait of risk-taking. The research sample was made up of 80 fully qualified teachers (Offir & Katz 1990). Two questionnaires were specially designed for use in this study: 1. Risk-taking questionnaire; 2. Attitude towards innovation (computer) in education questionnaire. The subjects were divided into three levels of risk-taking according to their responses to the risk-taking questionnaire. Analysis of variance (ANOVA) was then performed for risk-taking by attitude to innovation variables ($F=17.21$; $DF=2$; $p<0.000$). This test indicated significant differences between groups with different risk-taking levels. A *post-hoc* Scheffe test, designed to examine the significance of inter-group differences emanating from the significant ANOVA main effects was then performed. The results of the Scheffes test indicate that high-level risk-takers have a significantly more positive attitude to computers than medium-level risk-takers who have a significantly more positive attitude to innovation than low-level risk-takers. The risk-taking trait is apparently necessary for adopting a new and innovative instructional and teaching method and augurs well for the successful accommodation of novelty in the classroom situation. On the other hand, low-level risk-taking seems to indicate traditionalism in the teachers' perceptions of teaching and instruction, and as such, impairs the low-level risk-taker's ability to come to terms with novel classroom methods. These results confirm the findings of Katz (1984), that certain personality traits are required for successful adjustment in novel situations. When the use of a new method in the classroom situation is universally perceived to be totally successful, all teachers will agree to accommodate it in all their instructional activities. However, if the innovation is perceived to be only 50% successful in the classroom the low-level risk-takers will agree to incorporate it in only 20% of their teaching activities. Medium-level risk-takers will use the new method in 50% of their instruction and high-level risk-takers will agree to use it in 80% of their teaching activities. Therefore, only those teachers who feel comfortable with novel and innovative teaching methods will react positively to DL and will make a firm decision to use DL in the classroom and if a school wants to succeed in operating DL, the personalities of the teachers must be taken into consideration. A history of failure in operating DL can contribute to the teacher's negative attitude towards it. After a period of accommodation, during which DL can be shown to be a useful teaching and instructional instrument, DL can be introduced into the classroom of medium and low-level risk-takers who will be more inclined to accept DL as a new but not threatening teaching method. On the basis of these results it was concluded that evaluating the teacher-learner interaction in DL should be performed under natural circumstances where there is no proven failure in operating DL or where the personality of the teacher influences him or her to relate positively to innovation. Under such circumstances the teacher-learner interactions can be evaluated, since interference by other factors

will be minimal. The conclusions from the first phase of the research helped us choose the conditions for constructing the research aid for evaluating teacher-learner interactions.

Aid for evaluating teacher-learner interactions

Biggs (1982), presents a model of three P's, according to which learning is divided into three phases: presage, process and product. The first phase, "presage", includes the learner's abilities and information on the method and structure of program learning. The second phase is related to the "process" of learning and emphasizes different elements in the interaction between learners, subject matter, method of learning and teacher contribution. The third phase, "product", is related to the learner's achievement.
defines the importance of the teacher-learner interaction and its contribution to the process of analyzing the content of a message during a lesson. The interactivity of a lesson is an active process enabling the learner to adapt the lesson to his or her level and ability (Weller 1988). Interaction is a dominant and important factor in teaching. The interaction can lead the learner to take an active part in the learning process and encourages him to make decisions and analyze the knowledge transferred. Analysis of the interaction can help in drawing conclusions on the efficiency of the lesson (Hueyching & Reeve 1992, Jones & Vesilind 1992, Flanders 1970, Mcloughlin & Oliver 1995, Murry & Zuzovsky 1994, Hogelucht 1996, Brophy & Good 1969, Ruberg et al. 1996). Based on the information obtained, Henri (1992) developed an analytical model that can be used by educators for a better understanding of the learning process. This analytical model was developed to emphasize five dimensions of the learning process exteriorized in the message: participation, interaction, social, cognitive and metacognitive dimensions. Henri's content analysis model provides information on the participants as learners, and on their ways of dealing with a given topic. Thus informed, the educator can fulfill his main role of offering support to the individual and the collective learning process. Henri, in his article "Computer conferencing and content analysis" (1992), expressed his conclusion "We do not yet possess a body of knowledge concerning the pedagogical characteristics of the content of computer conferences, the scenarios of how the learning occurs, or the elements which give rise to learning. Only when we have a better understanding of computer-mediated learning will we be in a position to say that we are making the best use of the computer conferencing and content analysis - using its full potential. We believe that this understanding can come only from a finer-grained content analysis." Henri's analytical model has been evaluated. It was found that real and very accurate information about most of the "categories" can be supplied by this model. However, when dealing with the "interactivity" category, the results collected by different judges was not significant. The judges did not recognize the same "interactivity" categories. The same conclusion was reached by Oliver and Mcloughlin (1996). Based on these results, Oliver and Macloughlin suggested some changes in Henri's analytical model. They recognized five different kinds of interactions: social, procedural, expository, explanatory and cognitive.

We have used Oliver and Macloughlin's model for analyzing the different kinds of "interactions" in distance learning and in traditional teaching. It was found that the interactions most commonly used in distance learning are the procedural and expository interactions, whereas the most commonly used interactions in traditional teaching are the cognition, social and explanatory interactions (Offir & Lev 1999). In our research 50 hours of lessons were fully video taped, where twenty five hours recorded traditional teaching and 25 hours recorded distance learning. The traditional and the distance learning lessons were given by the same lecturers (n=5). Each lecturer was video taped for five hours and the video cassettes were analyzed and evaluated. The results of the video analysis led us to the following three conclusions: 1. There is no clear agreement between the analyzers as to the definition of each "interaction", since there is no list of behaviors which can help classify the different interactions; 2. The concept of "cognitive interactions" is not clear, since the other interactions (explanatory and expository) can sometimes be "cognitive interactions"; 3. The different interactions are not defined operationally. The results of our evaluation led us to make some changes in Oliver and Mcloughlin's analytical model.

In the process of constructing our model for analyzing the content of a distance learning lesson (M.A.C.L.), the five interactions were divided into two categories: interactions which supply an encouraging environment for studying (social and procedural interactions) and content-related interactions (explanatory, expository and cognitive interactions). Interactions that support learning (social and procedural) do not deal with the subject matter, nor with the content. The purpose of the social interaction is to create a personal

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connection between the teacher and the learner and to afford a relaxed environment, emotional support and encouragement for the learner, when necessary. The purpose of the procedural interaction is to deal with administrative problems arising during the lesson. These two interactions have the same goal, of helping create a supportive atmosphere for the learner.

Cookson and Chang (1995) make a distinction between a "positive emotional interaction" and a "negative emotional interaction". A positive emotional interaction is concerned with encouragement, decreasing tension and creating an informal atmosphere. With a negative emotional interaction the teachers behave formally and do not help and are not involved in the student's work, correct and react negatively towards the student, prevent help, etc. Our model divided the "social interaction" into two parts, negative and positive. Cookson and Chang (1995) helped us define the "procedural interaction". In our model the procedural interaction included administrative behaviors related to the students.

It was found that an element of "cognition interaction" is contained within the "explanatory" and "expository" interactions. Since these three interactions are cognitive in nature, the cognitive processes to be analyzed and how they can be recognized should be clearly defined. Furthermore, a clear distinction should be made between these three interactions. We are interested in analyzing "the way the student learns". Henri (1992) used the taxonomy developed by Ennis (1986). This taxonomy contains twelve different abilities. Henri reduced them to five abilities. This taxonomy can help define cognition skills.

The destination among the "explanatory", "expository" and "cognition" interactions can be based on Henri recognized different analysis levels in the cognitive domain. He mentioned the processing level: "surface processing" and "in-depth processing". Schmeck (1983) defined in-depth processing. Entwise and Waterston (1988) also made a distinction between "surface processing" and "in-depth processing", which enabled us to define the three content-related interactions: "explanatory" and "expository" interactions related to "surface processing and "cognitive interaction" related to "in-depth processing". Based on approach, the different interactions can be defined as: 1. Expository interaction: Teacher or learner present knowledge or ability; 2. Explanatory interaction: Teacher uses learner's reaction for explaining information; 3. Cognitive interaction: Behavior which presents ability for drawing conclusions, analyzing and decision making, learner applies information to new circumstances.

The literature and the information obtained by our researches directed us in developing our matrix for evaluating "interactions" during the process of operating "distance learning" lessons.

Table 1: Matrix for Analyzing Messages

Message	Unit	Interactions					
		Social		Proc.	Expo. Expl.		Cogn.
		Negative	Positive		Surface Process		In-depth Process
msg no. 1							
msg no. 2							
msg no. 3							

The researcher divided the interactions into messages. A message can be a single word or a complete sentence. The sentence can consist of a unit of meaning, for example, when the teacher says "your reaction is very exciting and interesting, but how does it complete your idea?" This sentence is a single message but has two units of meaning. The first is a "social interaction" and the second is a "cognitive interaction". We evaluated our analytical model for collecting messages during distance learning lessons. Eight judges observed the same video cassettes of two hours of recorded lessons. Their content analysis was directed by the existing content analysis matrix. The results are presented in table 2. The reliability of the matrix was proven in two stages: 1. Video casette of a DL lesson was given to three judges. They divided the lesson into conversation units; 2. Six judges used the matrix for analyzing the lesson's content.

Findings

Table 2: Correlation between judges in analyzing the content of DL lessons:

	G1	G2	G3	G4	G5	G6
G1 Pearson Correlation		.801**	.899**	.881**	.881**	.682**
Sig. (2-tailed)		.000	.000	.000	.000	.000
N		40	40	40	40	40
G2 Pearson Correlation	.801**		.815**	.800**	.697**	.593**
Sig. (2-tailed)	.000		.000	.000	.000	.000
N	40		40	40	40	40
G3 Pearson Correlation	.899**	.815**		.923**	.702**	.744**
Sig. (2-tailed)	.000	.000		.000	.000	.000
N	40	40		40	40	40
G4 Pearson Correlation	.881**	.800**	.923**		.709**	.789**
Sig. (2-tailed)	.000	.000	.000		.000	.000
N	40	40	40		40	40
G5 Pearson Correlation	.606**	.697**	.702**	.709**		.661**
Sig. (2-tailed)	.000	.000	.000	.000		.000
N	40	40	40	40		40
G6 Pearson Correlation	.682**	.593**	.744**	.789**.00	.661**	
Sig. (2-tailed)	.000	.000	.000	0	.000	
N	40	40	40	40	40	

** Correlation is significant at the 0.01 level (2-tailed).

Conclusion

The teacher-learner interaction was found to be an important factor in evaluating the learning process. Five different interactions were defined: social, procedural, expository, explanatory and cognitive. The collected research data led us to construct a matrix for evaluating the teacher-learner interaction. The reliability of our matrix was proved by six judges to have a significant correlation (at the 0.01 level) between these six judges. The information collected by our matrix can help in understanding the role of distance learning. It helps in drawing conclusions on the advantages and disadvantages of different kinds of technologies. During the past twenty years our research has directed us towards developing a model for decision making: where, when and how to use different means for achieving defined aims (Katz & Offir 1990, Offir 1988, 1990a,b,c). We were led to the conclusion that measuring the "interaction" should be performed under natural circumstances, where he teacher feels free to behave naturally. Any stressful atmosphere will affect the teacher-learner interaction. Our research has tried to define the most suitable circumstances for measuring these interactions.

Schools that plan to introduce DL into the classroom should do so only with teachers who are classified as high level risk-takers, or after DL has been shown to be a useful teaching instrument. The teacher will then be more inclined to accept DL as a new , non-threatening teaching method. This study directed us towards finding a method for combining different means to achieve the aim of education: content analysis of distance learning can supply information which will help in the decision making process in the DL field. An effective tool for analyzing the content of a lesson can help define the role of distance learning and the role of the teacher in the process of learning. Distance learning can be effective in transferring knowledge when there is no other method for reaching this information.

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